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Do not assume content reflects current scientific knowledge, policies, or practices.

FREE ANALYSIS OF FEEDING STUFFS.

The Station officers take pains to obtain for analysis samples of all feeding stuffs coming under the law, but the co-operation of consumers is essential for the full and timely protection of their interests. Whenever anyone believes that this law is being evaded in any way, he is requested to notify the Director of the Station.

The Station will promptly analyze samples of feeding stuffs sold in Maine taken in accordance with the following directions and report the results without any charge to the interested parties. Dealers and consumers are urged to avail themselves of this offer.

DIRECTIONS FOR SAMPLING.

The sample should fairly represent the feeding stuff and is best obtained as follows:

Open one or more full and unbroken packages, and mix well together the contents of each for a foot in depth, take out three cupfuls from different parts of the mixed portions of each package, pour them one over another upon a paper, intermix thoroughly and fill a tin spice or baking powder box from the mixture. Upon paper plainly write (1) the name of the goods; (2) the name of the manufacturer; (3) the guaranteed percentages of protein and fat; (4) the name and address of the dealer; and (5) the name and address of the sender. Securely wrap the box and description of sample in paper and send by mail to the

Agricultural Experiment Station,
Orono, Maine.

Maine Agricultural Experiment Station

BULLETIN No. 93. JULY, 1903.

POULTRY EXPERIMENTS IN 1902.

This Bulletin contains an account of breeding for egg production, including the egg record of the breeding pens for 1902; experiments upon the amount of floor space and other conditions of housing in relation to egg yields; and experiments in incubation of eggs.

Requests for bulletins should be addressed to the
AGRICULTURAL EXPERIMENT STATION,
Orono, Maine.

the hens of the State shall be increased to the extent of one dozen per bird, the value and importance of this work will be many fold its cost. While we are not breeding for fancy or show purposes, the birds are kept within the limits of the requirements of the breeds, so far as markings are concerned. No matter how great the number of eggs yielded, if they are not of good size, shape and color, the bird is rejected as a breeder.

It is yet too early to report what the results of this work are to be. Sufficient time has not elapsed since beginning the tests, to increase egg production, or establish claims of increased productiveness.

During the four years in which we have been selecting breeding stock by use of the trap nests, we have given full year tests to over a thousand hens and have found among them 35 that have yielded from 200 to 251 eggs each in a year. Several have each yielded only from 36 to 60 eggs, and three have never laid at all, to the best of our knowledge.

A study of the monthly record sheets shows not only great differences in the capacities of hens, but marked variations in the regularity of their work; some commencing early in November and continuing to lay heavily and regularly, month after month, while others varied much, laying well one month and poorly or not at all the next. We are not able to account for these vagaries, as the birds in each breed were bred alike and selected for their uniformity. All pens were of the same size and shape and contained the same number of birds. Their feeding and treatment were alike throughout.

With the most careful selections we could make, when estimating the capacities for egg yielding by the types and forms of birds, we found we were still including in our breeding pens hens that were small workers. Many of the light layers gave evidence of much vitality, and in many instances there were no marked differences in form or action, by which we were able to account for the small amount of work performed by them.

Every hen that has laid large numbers of eggs through the first, or the first and second, or more years, has shown much vigor and constitution. Some individuals have laid heavily for a few months and then drooped and died, seemingly because they could not stand the demands made upon them by heavy work.

RECORDS OF PULLETS, 1901-1902.

November 1st, 1901, 55 Barred Rocks, hatched during April, May and June, and 40 White Wyandottes, hatched during the same months, commenced their year's work with the trap nests. These birds were brought in during the last two days of October, from the portable houses, out on the range, where they were raised and had their liberty. Most of those hatched during April had been laying well during October, and some of them commenced the first of September. The eggs laid during September and October were lost, so far as individual records go; so the birds have not got credit for the work they actually performed duing their best 12 months. Reference to the table following shows October, 1902, almost bare of eggs. Could the birds that were laying when on the range the previous October, have started their records on the first day of that month, rather than a month later, and have been credited with the eggs they did lay during the 12 months following, more of them would have been placed above the 200 mark, and those now placed there would have their records materially advanced. As it stands now, however, we found seven birds among the 55 Barred Rocks with yields of from 201 to 240 eggs in the year.

The 55 birds laid 7,972 eggs during the year. Four birds were stolen, and if the 24 months they were out is accounted for we have 53 birds for the year averaging a little better than 150 eggs each. Three birds died during the year.

The 40 White Wyandottes laid 4,607 eggs, and if we deduct the time that was lost by those stolen, we have 39 birds for the year, averaging 118 eggs each. None of them reached the 200 mark. Six died during the year.

The yield of the White Wyandottes was lower this year than in previous years. This may in a measure be accounted for by the fact that they were allowed out of doors part of a wet day in April and quite a number of them took colds. A marked reduction in the egg yield was noted, extending over several weeks.

It is believed that one bird, No. 1,069, laid no eggs during the entire year. A very few eggs were found outside the trap nests, but none that could be traced to her. There appeared to be no rason why she should be a drone as she seemed to be in good health and her external form was not unlike that of her laying mates.

RECORD OF BARRED PLYMOUTH ROCK HENS HATCHED IN 1901.

Number of hen.	When hatched.	Monthly Egg Yields During												Yields to November 1st.
		1901.		1902.										
		November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	
1001	April ..	20	23	21	19	23	18	20	18	23	15	13	-	213
1002	April ..	24	24	13	10	22	16	16	21	18	20	16	5	205
1003	April ..	23	24	22	12	16	23	23	20	22	20	19	16	240
1004	April ..	20	6	13	3	18	22	25	23	20	21	2	-	173
1005	April ..	21	24	22	12	16	24	25	23	23	20	12	-	222
1006	April ..	22	20	10	3	9	6	-	16	3	-	-	-	89
1007	April ..	17	16	13	-	13	11	2	13	3	11	-	-	99
1008	April ..	-	18	-	19	15	10	*	-	-	-	-	-	62
1009	April ..	18	19	15	10	20	19	15	13	14	13	7	-	163
1010	April ..	19	25	22	15	9	18	14	18	16	11	20	1	188
1011	April ..	10	17	17	16	19	22	22	15	16	20	5	-	179
1012	April ..	4	21	12	13	21	22	22	19	14	21	19	12	201
1013	May ...	-	16	10	12	19	25	22	14	21	7	18	6	170
1014	May ...	4	21	23	23	11	†	-	-	-	-	-	-	92
1015	May ...	2	17	21	12	14	23	17	18	21	11	2	-	158
1016	May ...	-	12	17	7	10	11	10	13	11	12	14	1	118
1017	May ...	-	-	18	16	12	25	25	24	21	20	23	9	193
1018	May ...	-	-	15	15	19	21	11	19	9	4	-	-	113
1019	May ...	-	-	15	19	20	17	13	11	9	7	-	-	111
1020	May ...	-	-	3	2	15	18	17	*	-	-	-	-	55
1021	April ..	18	3	16	6	12	19	17	15	16	17	16	-	155
1022	April ..	-	10	17	12	13	12	15	14	13	10	-	-	116
1023	April ..	-	4	10	-	20	10	18	15	20	20	9	-	126
1024	April ..	16	22	21	16	22	24	21	20	20	16	-	-	198
1025	April ..	13	19	12	10	16	21	13	13	17	7	-	-	124
1026	April ..	14	20	17	12	20	15	19	18	16	23	19	3	196
1027	April ..	12	9	12	2	9	2	2	10	-	9	3	-	70
1028	April ..	10	20	21	22	24	24	16	20	15	16	18	-	206
1029	April ..	9	20	20	3	17	†	-	-	-	-	-	-	69
1030	April ..	7	24	25	11	24	10	15	13	10	9	6	1	155
1031	April ..	-	21	4	20	12	19	13	20	14	13	16	7	159
1032	May ...	-	16	22	18	22	19	19	16	18	17	11	-	189
1033	May ...	-	12	4	9	18	18	16	20	16	13	-	-	126
1034	May ...	-	12	9	17	24	11	18	14	14	16	12	6	153
1035	May ...	-	9	4	3	21	21	18	9	5	3	-	-	93
1036	May ...	-	7	22	18	12	15	16	18	20	14	15	17	174
1037	May ...	5	-	18	-	8	4	*	-	-	-	-	-	35
1038	May ...	1	-	20	4	11	23	7	21	19	5	-	-	111
1039	May ...	-	-	20	19	26	26	5	15	13	20	15	9	168
1040	May ...	-	-	8	16	13	14	16	13	11	14	-	-	105
1041	May ...	-	5	21	17	17	20	20	19	1	-	1	-	122
1042	May ...	10	20	22	9	22	23	10	8	21	5	7	-	164
1043	May ...	3	16	3	14	14	22	21	9	14	-	-	-	116
1044	May ...	-	16	16	-	19	23	19	16	16	12	17	9	173
1045	May ...	-	17	7	14	18	24	15	†	-	-	-	-	95
1046	May ...	-	14	16	6	7	18	18	15	16	14	22	21	168
1047	May ...	-	13	7	8	14	18	19	25	24	14	14	-	153
1048	May ...	-	15	20	17	13	19	12	†	-	-	-	-	96
1049	May ...	-	10	16	15	15	17	11	20	21	17	12	1	155
1050	May ...	-	8	21	15	14	20	11	16	17	15	7	18	162
1140	....	-	3	21	19	20	20	24	21	18	25	20	20	211
1141	....	-	-	17	9	18	20	19	16	15	18	8	-	148
1142	....	-	-	15	5	19	21	23	21	15	20	21	15	175
1143	....	-	-	8	19	25	21	17	22	16	19	7	3	157
1144	... .	-	-	7	15	21	19	22	21	-	-	-	-	105

* Died. † Stolen.

EGG RECORDS OF WHITE WYANDOTTE HENS HATCHED IN 1901.

Number of hen	When hatched.	Monthly Egg Yields During												Yields to November 1st.
		1901.		1902.										
		November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	
1051	April ..	21	14	13	10	13	16	2	10	11	10	–	–	120
1052	April ..	17	20	18	12	17	13	9	19	16	12	†	–	153
1053	April ..	17	18	18	18	11	13	22	17	18	12	17	10	191
1054	April ..	10	21	24	11	1	8	9	21	16	11	7	1	140
1055	April ..	5	24	7	15	8	3	–	–	14	19	17	16	128
1056	May ...	–	20	11	4	6	12	21	9	15	15	10	5	128
1057	May ...	–	15	15	2	13	17	9	18	24	20	16	11	160
1058	May ...	–	16	20	17	25	8	12	12	11	16	10	13	160
1059	May ...	–	20	10	10	16	17	12	17	3	4	–	–	109
1060	May ...	–	21	24	20	13	8	14	5	20	14	18	27	184
1061	May ...	–	19	22	11	10	–	7	13	14	16	15	16	143
1062	May ...	–	10	20	7	9	16	16	15	12	17	9	12	143
1063	May ...	–	1	15	–	3	*5	–	–	–	–	–	–	24
1064	May ...	–	1	7	–	*5	–	–	–	–	–	–	–	13
1065	June...	–	–	15	15	4	6	2	15	11	12	18	10	108
1066	May ...	5	–	5	–	7	19	11	18	19	19	4	–	107
1067	June...	–	–	15	6	5	13	12	8	9	14	–	–	82
1068	May ...	7	–	6	13	14	10	19	11	15	16	21	8	140
1069	May ...	–	–	–	–	–	–	–	–	–	–	–	–	–
1070	May ...	–	–	–	–	10	–	–	1	*	–	–	–	11
1071	April ..	17	16	11	17	11	13	12	16	10	10	13	3	149
1072	April ..	19	16	13	18	19	10	14	13	11	12	12	4	161
1073	April ..	14	21	12	1	18	16	17	13	9	13	2	1	137
1074	April ..	15	24	18	11	7	9	24	11	†	–	–	–	119
1075	May ...	–	21	24	20	19	11	4	18	15	15	21	17	185
1076	May ...	–	13	19	18	16	16	15	16	17	18	2	–	152
1077	May ...	–	18	23	17	16	4	†	–	–	–	–	–	78
1078	May ...	–	7	18	13	11	7	9	9	10	9	11	6	110
1079	May ...	–	11	13	10	12	11	12	10	9	11	8	13	120
1080	May ...	–	9	17	18	13	12	4	14	12	13	11	5	128
1081	May ...	–	8	19	3	12	15	11	15	16	9	12	19	139
1082	May ...	–	5	19	18	9	3	–	–	–	1	–	–	55
1083	May . .	–	6	12	–	8	2	–	2	*	–	–	–	30
1084	May ...	–	6	20	19	22	16	12	14	14	12	10	4	149
1085	June...	–	2	24	19	12	9	16	13	21	18	8	20	162
1086	June...	–	1	20	4	12	14	15	13	11	18	17	5	130
1087	June...	–	–	17	15	5	12	5	5	*	–	–	–	59
1088	June...	–	–	10	17	15	3	14	15	11	17	16	11	129
1089	June...	–	–	13	14	18	17	10	19	18	18	13	15	156
1090	June...	–	–	11	3	1	*	–	–	–	–	–	–	15

* Died. † Stolen.

THE BREEDING STOCK.

The numbers of the foundation stock now secured makes practicable the avoidance of in-breeding, and this is strictly guarded against, as it is doubtful if the in-bred hen has sufficient constitution to enable her to stand the demands of heavy egg yielding.

Males for our breeding operations have been raised from the most desirable of the foundation stock during the last three years.

Aside from the foundation stock in the following table, all of the other breeding females we are now carrying are tested hens that have laid over 180 eggs in a year; pullets whose mothers laid over 200 eggs in a year, and whose fathers' mothers laid over 200 eggs in a year; and pullets out of hens whose sires were out of 200-egg hens, the pullets themselves being sired by cockerels bred for two generations on both dam and sire sides from 200-egg producers.

FOUNDATION STOCK WITH EGG RECORDS TO OCTOBER 31, 1892.

Number of hens.	When hatched.	Breed.	Eggs laid in 1899.	Eggs laid in 1900.	Eggs laid in 1901.	Eggs laid in 1902.
4	April, 1898	W. W	201	140	130	119
14	April, 1898	W. W	208	141	28	-
47	April, 1898	W. W	200	167	-	-
403	April, 1899	W. W	-	219	162	72
428	April, 1899	W. W	-	217	138	-
445	April, 1899	W. W	-	208	139	89
480	April, 1899	W. W	-	218	172	93
729	April, 1900	W. W	-	-	203	134
742	April, 1900	W. W	-	-	208	113
753	April, 1900	W. W	-	-	217	150
765	April, 1900	W. W	-	-	226	22
770	April, 1900	W. W	-	-	207	102
777	April, 1900	W. W	-	-	233	42
101	June, 1898	B. P. R.	204	30	63	33
286	June, 1898	B. P. R.	206	147	138	-
303	April, 1899	B. P. R.	-	208	127	85
318	April, 1899	B. P. R.	-	237	102	49
326	April, 1899	B. P. R.	-	211	145	104
609	April, 1900	B. P. R.	-	-	200	176
612	April, 1900	B. P. R.	-	-	209	138
617	April, 1900	B. P. R.	-	-	251	133
630	April, 1900	B. P. R.	-	-	213	137
635	April, 1900	B. P. R.	-	-	201	143
672	April, 1900	B. P. R.	-	-	210	185
676	April, 1900	B. P. R.	-	-	209	102
1001	April, 1901	B. P. R.	-	-	-	213
1002	April, 1901	B. P. R.	-	-	-	205
1003	April, 1901	B. P. R.	-	-	-	240
1005	April, 1901	B. P. R.	-	-	-	222
1012	April, 1901	B. P. R.	-	-	-	201
1028	April, 1901	B. P. R.	-	-	-	206
1140			-	-	-	211

COMPARISONS OF THE YIELDS OF HENS DURING THE FIRST AND SECOND YEARS OF LAYING.

With many poultrymen the idea is prevalent that if a hen lay but few eggs the first year, she is likely to do better the second year, than though she laid well during the first.

The data so far secured, does not show that hens that yield 120 eggs, or less, the first year, yield satisfactorily the second

EGGS YIELDED DURING FIRST, SECOND AND THIRD YEAR OF LAYING.

Number of hens.	Breed.	When hatched.	When commenced laying.	Number of eggs laid during first full year.	Number of eggs laid first year Nov. 1 to Nov. 1.	Number of eggs laid second year Nov. 1 to Nov. 1.	Number of eggs laid third year Nov. 1 to Nov. 1.
6	B. P. R.	April	October	161	161	61	
10	B. P. R.	April	October	175	175	8	*March.
26	B. P. R.	April	November	158	155	118	
30	B. P. R.	April	November	165	165	112	
31	B. P. R.	April	November	175	175	94	
36	B. P. R.	April	October	201	181	159	
45	B. P. R.	May	December	166	142	89	
51	B. P. R.	May	December	191	191	94	
74	B. P. R.	May	December	182	165	151	
76	B. P. R.	May	December	169	169	40	
80	B. P. R.	May	January	160	140	103	
93	B. P. R.	April	October	160	160	145	
101	B. P. R.	May	January	204	201	30	63 *April
114	B. P. R.	May	January	139	136	130	
120	B. P. R.	May	January	188	184	99	*Sept.
126	B. P. R.	May	January	180	152	162	
137	B. P. R.	May	January	155	155	116	
151	B. P. R.	May	January	155	135	161	
159	B. P. R.	May	January	175	137	168	
205	B. P. R.	June	February	191	165	165	
208	B. P. R.	June	January	169	151	82	
209	B. P. R.	June	January	180	154	94	
228	B. P. R.	June	February	153	120	115	
246	B. P. R.	June	February	143	143	46	
281	B. P. R.	June	February	167	129	125	
286	B. P. R.	June	February	206	191	147	138 *Sept.
289	B. P. R.	June	February	181	151	150	
300	B. P. R.	June	February	175	138	148	
303	B. P. R.	May	November	208	208	127	85
318	B. P. R.	April	November	237	237	102	49
324	B. P. R.	April	November	163	163	71	
326	B. P. R.	April	November	211	211	145	104 *Sept.
603	B. P. R.	April	November	196	196	16	*June.
607	B. P. R.	May	November	170	170	172	
608	B. P. R.	June.	February	195	195	166	
609	B. P. R.	April	November	200	200	176	*June.
611	B. P. R.	May	January	185	185	147	
612	B. P. R.	April	November	209	209	138	
617	B. P. R.	May	November	251	234	150	
618	B. P. R.	April	November	191	191	73	*June.
622	B. P. R.	May	January	99	99	67	
623	B. P. R.	May	November	183	183	124	
626	B. P. R.	May	December	107	107	22	
627	B. P. R.	May	January	61	61	20	*Feb.
630	B. P. R.	April	November	217	213	137	
632	B. P. R.	May	December	217	185	106	
654	B. P. R.	May	January	92	92	35	
635	B. P. R.	May	November	201	190	143	
642	B. P. R.	May	November	169	169	30	
644	B. P. R.	May	January	74	74	12	
648	B. P. R.	April	November	182	182	34	
649	B. P. R.	May	December	190	190	88	
651	B. P. R.	May	December	181	170	103	
654	B. P. R.	May	December	189	189	13	*March.
653	B. P. R.	May	January	95	95	82	*July.
657	B. P. R.	June	January	180	177	58	
664	B. P. R.	May	November	175	175	98	
670	B. P. R.	May	December.	167	167	86	
671	B. P. R.	May	November	167	167	51	*May.
672	B. P. R.	May	November	210	200	185	
676	B. P. R.	May	November	209	209	102	
684	B. P. R.	June	January	170	170	107	
686	B. P. R.	June	February	51	51	86	
689	B. P. R.	June	January	181	181	70	
693	B. P. R.	June	February	47	47	44	*July.
698	B. P. R.	June	January	192	192	133	

All except those marked with a star completed the full second or third year Those marked with a star died in months indicated.

year. Those that yielded in the vicinity of 100 the first year have yielded very lightly the second year.

The left hand column of egg yields, in the table on page 75, shows the numbers of eggs yielded by each hen during the first full year after she commenced laying, and in most cases it is greater than when the year is reckoned forward from November 1st.

We have generally found it necessary to have the pullets of the breeds we have used, hatched by the last of April in order to have them laying regularly by the first of November. They then have a full year for work before they are removed the following fall, to make room for the new pullets that must be in winter quarters early, if they are to do satisfactory work. If the pullet does not commence laying until January, she does not have a full year before she has to give way to the young stock, by the last of October, or the first of November.

This feature of poultry management counts for a great deal and has much to do with determining the incomes of flocks. The column recording the yearly yields of the first and second year's laying, are worthy of careful study.

AMOUNT OF FLOOR SPACE AND OTHER CONDITIONS OF HOUSING IN RELATION TO EGG YIELD, AND INCUBATION EXPERIMENTS IN 1902.

G. M. Gowell.

The cost of housing poultry is a very important item to the poultryman, and the amount of floor space required by each hen is a much discussed question which is worthy of the most careful consideration and investigation. One test of this important subject has been undertaken and is here reported. Since it furnishes only limited data, the work will be continued.

A building 12 feet wide and 76 feet long, with walls 6 feet high and a double pitch roof, was divided in the middle, making two rooms, each 12 by 38 feet in size. The entire floor space was available to the use of the birds, as the roost platform or floor of the closet was elevated three feet above the floor. The front of this long closet, or roosting room, had a light frame, covered with white drilling, thoroughly saturated and glazed with boiled linseed oil. This framed curtain was hinged at the top and turned out into the house during the day, but shut down at night, from fall until spring, thus confining the birds in a small space, where it was hoped they would keep themselves warm. From fear that the air would be foul, the closet was not made very close and it froze in there quite hard during the cold nights and the results were that the birds did not commence laying much until March.

The house did not have glass windows, but the front wall had four frame curtains similar to those covering the front of the roosting closet. These cloth covers were 3 by 10 feet in size and came down to within a foot and a half of the floor. This, we think, is too low, as the wind blew in directly on to the birds, when the curtains were up, during the day.

In one half of this building, in Pen No. 1, 90 May hatched Barred Plymouth Rock pullets were put, and daily egg records kept with them for eleven months. In the other half, in Pen No. 2, 60 pullets, mates to those in Pen No. 1, were put, on the same day, and treated in the same manner.

EGG RECORDS OF HENS IN HOUSING EXPERIMENTS.

Months.	Pen No. 1. Size 12x38 feet. 90 birds.		Pen No. 2. Size 12x38 feet. 60 birds.	
	Number of hens each month.	Eggs laid each month.	Number of hens each month.	Eggs laid each month.
November	90	25	60	39
December	90	110	60	154
January	90	427	60	339
February	89	473	59	465
March	89	1214	59	891
April	89	1430	57	889
May	88	1288	57	855
June	85	1216	54	800
July	85	1281	54	808
August	83	997	52	724
September	79	833	48	571
Total yield for eleven months	-	9294	-	6535
Average number of hens in each pen	87	-	56½	-
Average yield per hen for whole period	-	109	-	116

Where the 90 birds were together they averaged 103 eggs each, and where the 60 birds made up the flock, 109 eggs was the average to each one. Where the larger number of birds were together they did not appear to suffer from confinement during winter, as only one bird was lost from November 1st to May 1st.

In the pen where the 90 birds were kept, the floor space was 5.1 square feet per bird, and in the pen where the flock numbered 60 birds the floor space was 7.6 feet per bird.

It is doubtful if there are other lines of investigation where results are likely to be of greater value to practical poultrymen than the study of sizes of flocks and floor spaces for birds. If floor space can be as economically used by leaving it in one large room as by dividing it into several small ones, even though the number of surface feet remains the same per bird, the labor of feeding, cleaning and egg-collecting will be less in the undivided house. Again; the larger room offers greater field for the range of each bird even though it be more densely populated per surface foot than does the smaller one.

CLOSE ROOSTING CLOSETS.

In comparison with the above described curtained-front house with its closet roosting room, a small cheap building, but with a much warmer roosting closet, was stocked with pullets of the same breed and age as those put in the colder house.

It is not intended to contrast the work done in this second house with the pens noted above so far as floor space, per bird, is considered, for it was made much warmer, but was after the same plan, with curtained closets for sleeping quarters, and oiled cloth, on frame, to cover the large opening in front. The lower edge of the front curtain was three feet above the floor, and this bulkhead kept the wind from blowing directly on to the birds when they were on the floor scratching their food out of the 8-inch deep, dry straw. The roosting closet was made as near air tight as a common carpenter would make it. The outside walls of the building, and up the roof where it came in contact with the roosting closet, were packed with soft, fine hay. Its floor surface was 250 feet and we put 50 of the birds in it and treated them in the same way as those in the colder house. They did not get to laying until well along into November, but yielded 4.14 eggs each that month. In December the birds averaged 14.4 eggs each; January, 14.94; February, 13.4; March, 19.34; April, 18.72; May, 17.20; June, 14.3; July, 15.4; August, 12.3.

They averaged 144.4 eggs each, in ten months, and had still two months in which to work before completing their year, when nearly half of them were stolen and the record keeping interfered with. There appears to be no reason why the birds in this house should do better than those in Pens Nos. 1 and 2 except that they were better protected from the cold, both day and night.

The curtained-front house with closet roosting room is inexpensive to construct, but one condition is imperative: the roost room must be as near air tight as it is practicable to make it when the curtain is closed down. There is no need to worry about ventilation. If the closet was filled with water it would quickly leak out. The cracks around the curtain frame, at top and bottom, furnish openings for the entrance of fresh, and escape of foul air.

The main part of this house is cold of course, but the straw on the floor is always dry, and the air clean. While the birds are on the roosts—in bed—they are warm. They come down to their breakfast and spend the day in the open air. Such treatment gives vigor and snap to the human, and it seems to work equally well with the hen.

EXPERIMENTS IN INCUBATION IN 1902.

In many experiments there are disturbing causes which interfere with the work and render unreliable the results, which seem to point in certain directions, and indicate certain truths. This is true with all of the investigations we have made concerning incubation. We have in use several good incubators and have had considerable experience in operating them and others. We think we have no trouble in getting as good results as when the eggs are submitted to the careful treatment given by the mother hen. With eggs from hens that have been laying but a short time we usually get hatches of from 70 to 80 per cent from the entire number of eggs incubated.

During the last three years we have planned and carried to completion a large number of incubation tests. By use of the trap nests we were able to know the source of every egg and it was thought that the eggs from the same hens, all laid within ten days of each other, and divided by selecting the first, third, fifth, etc., for one lot and the second, fourth, sixth, etc., for the other lot, would be nearer alike in freshness, fertility and germ strength, than though they were selected from different hens, however much alike such birds might be.

In this way we could have all of the eggs of each hen in a class of her own—in two lots—and it was thought that the comparison of one hen's eggs with each other would yield more reliable data than would the comparison of the eggs from different hens. This assumption is true if the individual bird yields uniformly fertile eggs throughout the test. As investigations progressed we became aware of the great variation in the chick producing capacity of eggs, and that the assumption of uniform fertility in the eggs of each hen for considerable periods of time was not sustained.

In the table on pages 82 and 83 there is given, in addition to the egg yield of 76 hens, an incubation test of the eggs laid during the last 10 days of May, 1902.

The data show plainly the great variability in the fertility of the total egg yield of different hens; some birds yielding eggs that are all highly fertile, and others giving eggs that are all completely infertile, being as clear after 21 days of incubation as at the start. Again some hens are very irregular in the fertility of their eggs; an egg laid one day yielding a chick, while that laid on the next is completely infertile; or they are fertile for a day or two, or more, and then infertile, becoming fertile again after one, two, or more eggs are laid. This seems to be true with some individuals, whether they are laying regularly or irregularly, or whether they have been laying a long or a short time. The eggs from other hens seem to be slightly fertile, the embryo dying before the tenth or twelfth days. This appears to be regular with some hens, and irregular with others; as some give eggs of low fertility one day and high fertility on the days immediately following, or preceding.

The results given in the table plainly show the great variability in fertility. For instance; the egg of the first hen on the list, No. 511, was laid May 21st, and it stopped developing about the tenth day of incubation. The next one was laid May 24th and it yielded a good chick. Both eggs were in the same incubator, on the same shelf, where there is every reason for believing that the conditions were alike. The next egg was laid by the same hen two days later—May 26th—and the germ died on the sixteenth day of incubation. She laid an egg the next day following and development stopped in it on the tenth day of incubation. The next eggs were laid by her on the 29th and 30th insts. and both yielded good chicks.

During this ten days test she laid six eggs, three of which yielded chicks, and in three of which development stopped after having advanced half the period, or more. Had these six eggs been taken promiscuously and divided into two lots which were treated differently, three chicks possibly might have been secured from one lot, and three, half developed dead chicks, from the

THE WORKING HISTORY OF HENS FROM NOVEMBER UNTIL MAY AND THE FERTILITY OF THEIR EGGS DURING THE LAST TEN DAYS OF MAY AS SHOWN BY INCUBATING THEM.

Numbers of hens.	When hatched.	Eggs laid in previous year.	Number of Eggs Laid During							Dates on which Eggs Were Laid and Result of Incubation.									
			November.	December.	January.	February.	March.	April.	May.	May 21.	May 22.	May 23.	May 24.	May 25.	May 26.	May 27.	May 28.	May 29.	May 30.
	1900.																		
511 P. R	June	182	....	....	15	18	9	23	21	10	....	....	C'k	....	16	10	....	C'k	C' k
531 P. R	June	138	....	....	19	18	16	21	15	C'k	21	C'k	....	C'k	C'k	....	C'k	C'k	....
542 P. R	June	133	....	....	16	16	11	20	20	Inf	....	Inf	....	Inf	Inf	Inf	....	Inf	Inf
550 P. R	June	160	....	....	....	5	13	21	17	C'k	Inf	....	16	21	....	C'k	....	Inf	C'k
557 W. W	June	82	1	21	12	4	2	18	18	Inf	Inf	....	Inf	Inf	....	....	Inf	Inf	Inf
566 P. R	June	77	....	....	15	14	14	12	19	C'k	....	21	C'k	....	....	C'k	C'k	21	....
563 W. W	June	97	16	....	2	4	9	20	18	Inf	....	Inf	Inf	....	Inf	C'k	....	Inf	....
568 P. R	October	38	....	....	....	7	8	21	18	21	....	21	....	12	C'k	....	C'k	10	....
585 W. W	October	80	17	21	7	2	2	1	14	Inf	..	....	....	....	....	....	....	....	....
586 P. R	October	60	....	....	12	15	10	8	16	21	....	....	12	14	....	18	....	18	....
589 P. R	October	68	....	7	19	2	10	14	17	Inf	....	C'k	....	....	....	....	....	12	....
607 P. R	April	170	....	6	5	10	21	23	23	C'k	....	C'k	....	Inf	C'k	....	C'k	C'k	....
608 P. R	April	195	....	....	....	6	....	18	25	12	8	....	14	....	....	21	C'k	C'k	8
611 P. R	April	185	....	....	10	19	22	12	16	C'k	....	21	C'k	....	C'k	C'k	....	C'k	C'k
626 P. R	April	107		....	....	....	5	8	9	C'k	C'k	....	....	....	....	C'k	.	C'k	C'k
634 P. R	April	92	....	....	....	....	8	8	8	....	....	....	....	....	....	C'k	..	C'k	....
649 P. R	April	190	....	....	....	5	9	14	12	....	....	....		....	21	....	8	Inf	12
651 P. R	April	170	....	....	....	....	....	19	22	21	....	16	21	....	Inf	14	21	12	12
657 P. R	April	177	....	....	....	5	15	12	11	C'k	....	....	C'k	C'k	....	C'k	C'k	....	12
664 P. R	April	175	....	....	....	7	13	20	18	....	....	....	....	....	16	....	....	C'k	....
670 P. R	April	167	....	....	....	5	6	14	19	....	17	....	....	....	C'k	....	21	....	C'k
684 P. R	April	170	....	....	....	2	13	16	12	....	21	C'k	Inf	20	C'k	....	19	19	17
698 P. R	April	192	....	....	....	7	24	17	20	....	21	....	18	18	C'k	....	....	....	....
709 W. W	April	167	....	....	13	8	8	17	15	....	Inf	Inf	....	Inf	Inf	....	Inf	19	....
762 W. W	April	186	....	3	3	3	6	13	18	Inf	....	Inf	....	12	Inf	....	....	Inf	Inf
780 W. W	April	166	....	....	....	11	7	15	18	20	Inf	....	Inf	C'k	....	19	Inf	17	....
789 W. W	April	165	2	....	....	14	11	20	17	20	....	....	....	18	C'k	....	Inf	....	Inf
811 W. W	April	102	....	....	....	3	10	10	11	....	Inf	....	....	....	Inf	....	....	....	....
812 P. R	June	105	....	....	5	3	22	11	16	....	....	Inf	....	....	C'k	17	....	20	C'k
813 P. R	June	140	....	....	....	2	22	21	16	C'k	Inf	19	20	....	....	....	....	....	....

	1901.																		
1001 P. R	April	...	20	23	21	19	23	18	20	...	...	Inf	...	Inf	10	19	...	...	...
1003 P. R	April	...	23	24	22	12	16	23	23	C'k	Inf	20	...	21	C'k	Inf	Inf	...	21
1004 P. R	April	...	20	6	13	3	18	22	25	...	C'k	19	8	C'k	...	C'k	C'k	8	17
1005 P. R	April	...	21	24	22	12	16	24	25	18	C'k	...	18	Inf	Inf	...	Inf	Inf	Inf
1009 P. R	April	...	18	19	15	10	20	19	15	C'k	19	19	15	21	C'k	...	...	...	...
1011 P. R	April	...	10	17	17	16	19	22	22	...	Inf	C'k	Inf	...	...	20	19	...	...
1012 P. R	April	...	4	21	12	13	21	22	22	19	...	20	...	C'k	Inf	19	...	20	20
1013 P. R	May	...	...	16	10	12	19	25	22	19	19	...	21	Inf	C'k	Inf	C'k	...	Inf
1015 P. R	May	...	2	17	21	12	14	23	17	Inf	10	Inf	...	...	...	...	...	...	...
1016 P. R	May	...	...	12	17	7	10	11	10	...	...	...	...	...	10	10	...	...	...
1017 P. R	May	...	...	...	18	16	12	25	25	Inf	Inf	...	18	Inf	...	Inf	...	Inf	Inf
1018 P. R	May	...	...	...	15	15	19	21	11	...	...	...	...	...	...	Inf	C'k	12	...
1019 P. R	May	...	...	...	15	19	20	17	13	Inf	Inf	12	...	...	...	...	...	...	...
1020 P. R	May	...	...	...	3	2	15	18	17	...	C'k	C'k	18	C'k	...	21	C'k	21	...
1021 P. R	April	...	18	3	16	6	12	19	17	C'k	...	C'k	...	C'k	...	21	...	C'k	Inf
1023 P. R	April	...	...	4	10	...	20	10	18	C'k	Inf	C'k	C'k	12	...	C'k	20	12	...
1024 P. R	April	...	16	22	21	16	22	24	21	Inf	Inf	...	Inf	Inf	Inf	Inf	Inf	Inf	Inf
1025 P. R	April	...	13	19	12	10	16	21	13	...	...	...	...	...	12	Inf	Inf	...	Inf
1026 P. R	April	...	14	20	17	12	20	15	19	8	Inf	...	Inf	...	...	...	...	...	12
1028 P. R	April	...	10	20	21	22	24	24	16	...	...	...	...	...	Inf	C'k	Inf	Inf	Inf
1032 P. R	May	...	...	16	22	18	22	22	19	...	Inf	C'k	C'k	...	Inf	...	...	Inf	...
1033 P. R	May	...	...	12	4	9	18	18	16	Inf	C'k	...	19	21	...	C'k	Inf	C'k	21
1034 P. R	May	...	...	12	9	17	24	11	18	Inf	18	Inf	Inf	...	Inf	Inf	14	Inf	Inf
1035 P. R	May	...	...	9	4	3	21	21	18	...	...	Inf	...	12	16	...	...	12	21
1038 P. R	May	...	1	...	20	4	11	23	7	...	...	...	...	...	...	...	Inf	C'k	C'k
1039 P. R	May	...	...	...	20	19	26	26	5	...	...	...	...	...	...	C'k	C'k	C'k	...
1040 P. R	May	...	...	...	8	16	13	14	16	...	...	...	...	Inf	...	...	Inf	Inf	Inf
1041 P. R	May	...	...	5	21	17	17	20	20	Inf	Inf	Inf	Inf	...	...	...	C'k	...	Inf
1043 P. R	May	...	3	16	3	14	14	22	21	...	...	...	21	C'k	C'k	18	21	21	19
1044 P. R	May	...	...	16	16	...	19	23	19	Inf	8	...	12	Inf	Inf	C'k	Inf	Inf	...
1045 P. R	May	...	...	17	7	14	18	24	15	8	Inf	Inf	...	...	Inf	Inf	...	...	...
1046 P. R	May	...	...	14	16	6	7	18	18	...	...	...	...	...	...	...	21	C'k	C'k
1047 P. R	May	...	...	13	7	8	14	18	19	...	19	...	...	21	C'k	21	...	Inf	C'k
1049 P. R	May	...	...	10	16	15	15	17	11	...	...	18	C'k	...	8	12	12	8	...
1050 P. R	May	...	...	8	21	15	14	20	11	C'k	...	C'k	C'k	C'k	C'k	C'k	...	C'k	...
1052 W. W	April	...	17	20	18	12	17	13	9	Inf	...	...	Inf	...	...	...	Inf	...	...
1053 W. W	April	...	17	18	18	18	11	13	22	...	Inf	...	Inf	Inf	...	Inf	Inf	...	Inf
1054 W. W	April	...	10	21	24	11	1	8	9	Inf	Inf	Inf	...	Inf	...	...	...	Inf	Inf
1056 W. W	May	...	...	20	11	4	6	12	21	C'k	12	...	12	Inf	Inf	...	Inf	Inf	Inf
1057 W. W	May	...	...	15	15	2	13	17	9	...	Inf	...	C'k	C'k	Inf	...	...	...	...
1059 W. W	May	...	...	20	10	10	16	17	12	Inf	...	8	Inf	...	...	...	...	...	...
1062 W. W	May	...	...	10	20	7	9	16	16	...	Inf	12	...	...	Inf	...	21	18	...
1065 W. W	June	...	...	...	15	15	4	6	3	...	...	...	...	...	...	Inf	Inf	C'k	...
1066 W. W	May	...	5	...	5	...	7	19	11	...	...	...	...	Inf	21	...	21	Inf	12
1067 W. W	June	...	...	...	15	6	5	13	12	...	...	...	21	...	21	21	...	C'k	...
1068 W. W	May	...	7	...	6	13	14	10	19	...	19	C'k	...	...	...	C'k	C'k	21	C'k

C'k means that a chick was hatched from the egg. Inf. means that the eggs were completely infertile. The numerals in the right-hand side of the table indicate that the development of the egg ceased on or near the day indicated. Thus, 10 means that development ceased about the tenth day of incubation.

other lot, and the conclusion drawn that one lot had right and the other lot wrong conditions. Or, if differently divided, the results might not have been so pronounced, but equally unreliable.

The incubation tests made in 1902 were undertaken in the belief that the knowledge of the source and history of every egg would enable us to avoid disturbing causes and leave only the leading questions for consideration. Had the investigations been made with eggs taken from the flock or pens of hens, as laid, without reference to the individual sources from which they came, and divided into lots, and subjected to the conditions of the test, results could have been secured that, unquestioned, might have seemed to give positive evidence, pro or con, and which might have been published without any suspicion that the results were untrustworthy.

In the twelve incubation tests which we have made this year, but not reported, the eggs from each hen were divided, in the order in which they were laid, by alternation, into two lots in each test. The results of such division, if applied to hen No. 511 would have given one chick hatched from lot 1 and two chicks hatched from lot 2, and yet the results would not have been produced by incubation conditions, but rather by some previous conditions for which we could not account. No. 511 is discussed because she is first on the list; what is true of her holds good in a greater or less degree with many others.

Could eggs of known fertility be secured, incubation tests could be made that would be simple and reliable. In the light of the data given in the table and that obtained in the twelve incubation tests there appears to be no means of securing positive information regarding this point. In the absence of positive information probably the best plan to pursue is to secure birds by test that yield eggs of uniformly high fertility and rely upon the averaging of the results of many incubation tests. In this test the birds were by no means fresh, but had been working several months.

It does not appear that heavy yielding is a hindrance to fertility if the birds have had a period of rest following it, and resumed heavy work.

One of the first birds found to yield over 200 eggs per year in 1899 was No. 4. During the first year she laid 201 eggs; 140 the second, 130 the third, 119 the fourth, and she is now doing her fifth year's work. She was one of the first birds selected for the foundation stock of our breeding operations, consequently the eggs secured from her, each of the last three years, from February to July, have been incubated, and mostly found sufficiently fertile to yield chicks, or developed as far as the 17th day.

No. 286 was a late hatched chick in 1898, and did not commence laying until February 12, 1899. In a year forward from that day she laid 206 eggs; 157 during the second, and 138 in her third year. When nearly three and a half years old she died from an accident, having laid 119 eggs during the last 160 days she lived. Her eggs were remarkable for their fertility, every year, very few of them failing to yield well developed chicks.

No. 318 was hatched in April, 1899. During her first year she laid 237 good brown eggs. After she had laid 200, the next dozen were saved as laid, and found to weigh 1 ℔, 11¼ ounces. In her second year she laid 102 eggs, and 49 in her third year. She now looks the picture of perfect health and vigor, and is not over fleshy or "baggy." Vigorous as she has always been, but very few of her eggs have yielded chicks, or been well fertilized, although she has been bred to different males.

Two other birds were remarkable for their small yields. No. 686 laid 67 as her first full year's work, and No. 693 laid 47. In May of their second working year, after their winter vacation, the 15 eggs they both laid during that month were found to be completely infertile. In these cases it certainly was not heavy work that caused infertility. Both birds always appeared to be in good health until about three months after the test when No. 693 failed and died.

Although in a general way we may regard infertility as likely to result after hens have been laying long and heavily, it is by no means true that it is always so.

THE ILLUSTRATIONS.

Illustrations of four of the heaviest laying birds which we have are shown, and also two of the poorest producers.

The White Wyandotte hen No. 1069 was kept until she was four years old and we are very sure she laid no eggs. She was a vigorous, well formed bird, of active habits, and always in apparently good health. She was not masculine in her make up. As may be seen by her picture, she was not sufficiently unlike No. 403—her mate of the same breeding—as to even in a small degree account for their varying functions.

No. 403 is now over four years old. During her first year's work she laid 219 eggs; 162 during the second year; 72 the third year. She is now at her fourth year's work.

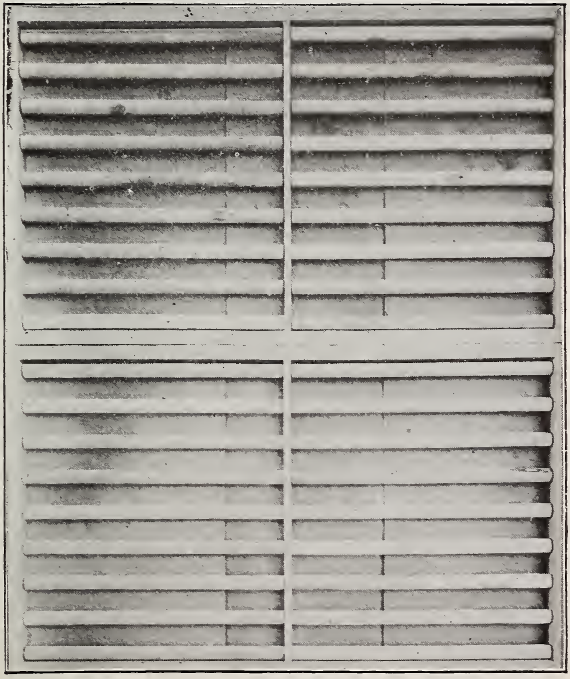
Four illustrations of Plymouth Rocks are shown. No. 588 was a fairly well made bird of medium weight. She was rather fine for a representative of her breed, but she was in no respect effeminate or lacking in vitality. She did not lay until she was nine months old. She then laid eight eggs in one month, and laid no more during the remaining six months she was kept.

No. 318 is now four years old. She is a strong, muscular bird, of large size, always fleshy but never over much so. She is very energetic and active. The 236 eggs she laid the first year and their extra size and color easily makes her one of the best birds we have bred.

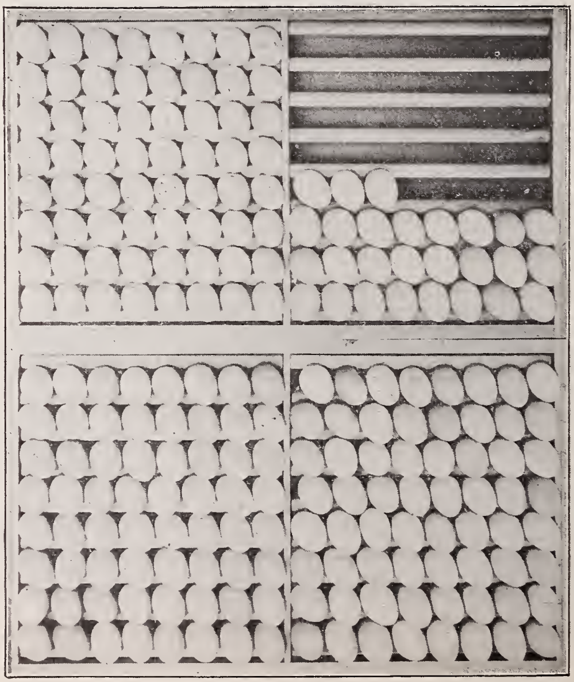
No. 617 yielded 251 eggs in her first year, the most of any bird we have bred. They were of good size and shape, but hardly of sufficiently high color. In size, form, and feature she is in marked contrast with No. 318, being lighter in weight, narrower in body, both front and rear, with lighter neck and fine head and comb. She would be regarded as of the egg type, by those people who profess to tell the egg yielding capacities of hens by their forms and markings, while No. 318 would be regarded as rather of the beefy type.

No. 1003 is somewhat like No. 318 in form, being large and more compact and fleshy than No. 617. Her yield was 240 large brown eggs the first year she laid.

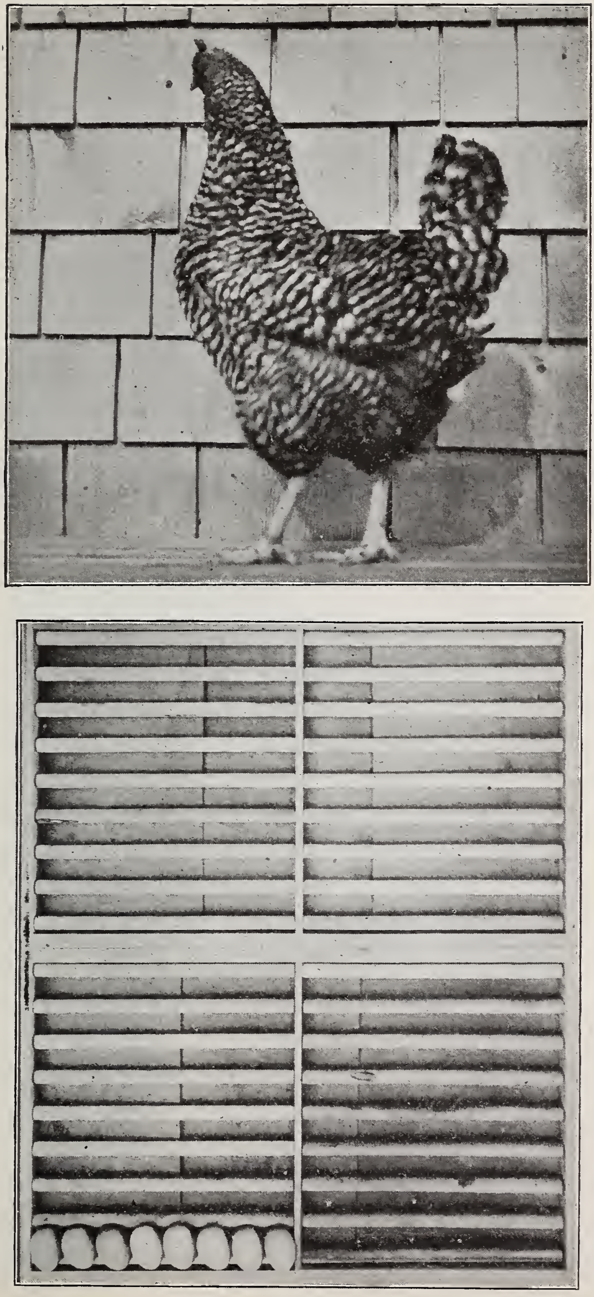
A study of the illustrations, while not as satisfactory as an examination of the living birds, is worthy the attention of investigators and breeders.



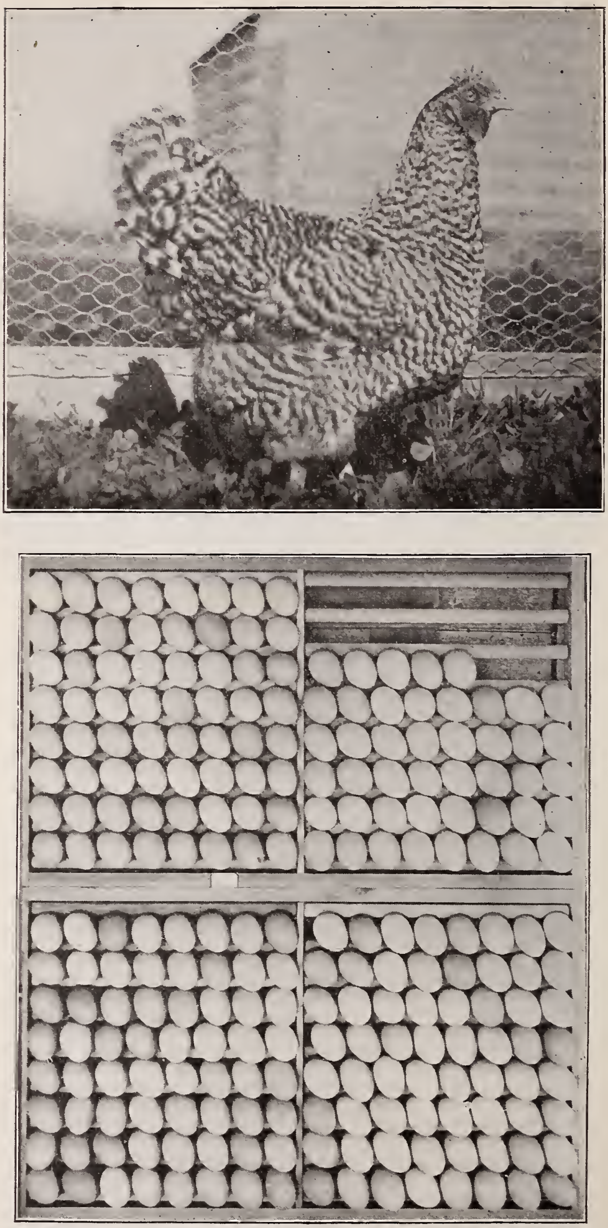
Figs. 18 and 19, White Wyandotte hen, No. 1069. Laid no eggs.



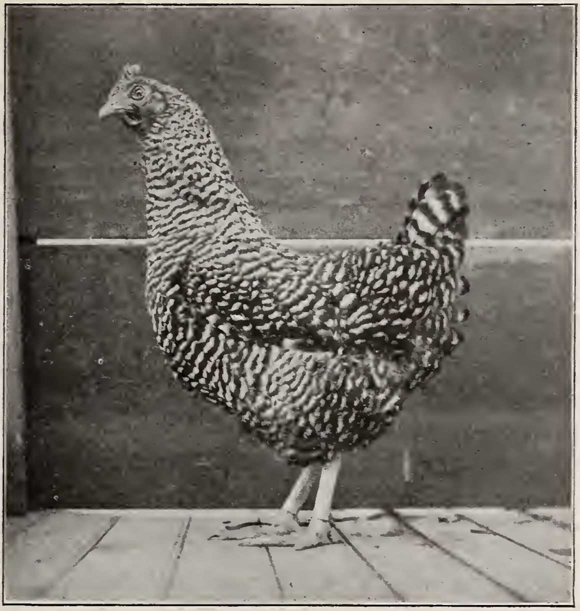
Figs. 20 and 21, White Wyandotte hen, No. 403. Laid 219 eggs in first year.

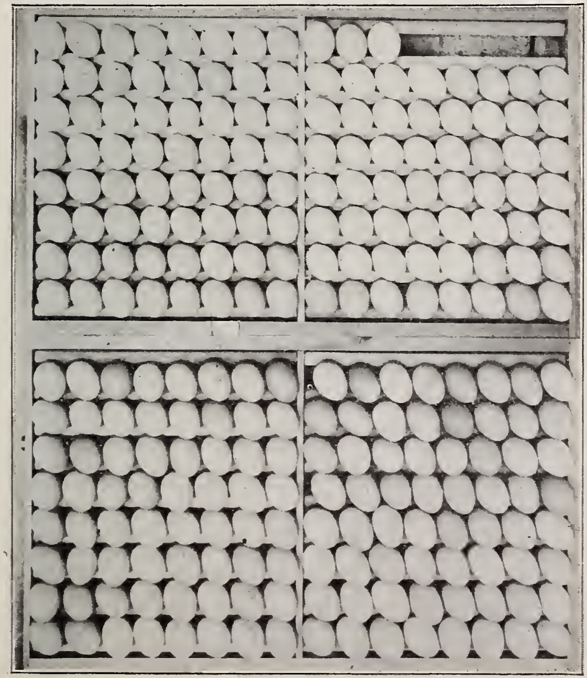


Figs. 22 and 23, Barred Plymouth Rock hen, No. 588. Laid 8 eggs in first year.

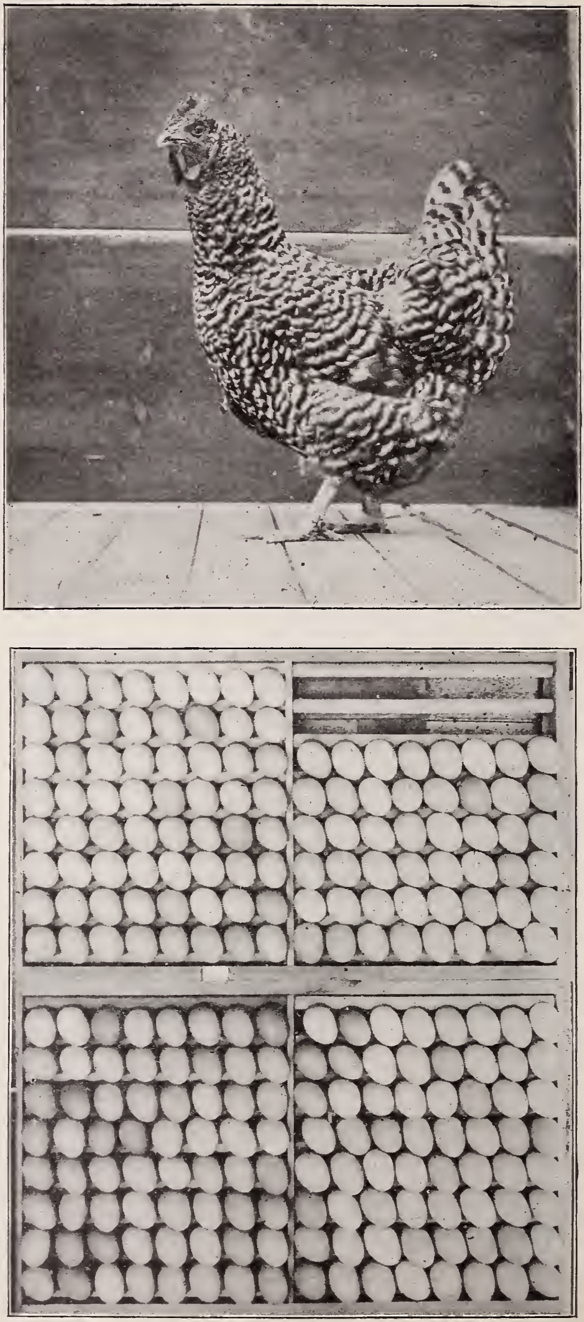


Figs. 24 and 25, Barred Plymouth Rock hen, No. 318. Laid 237 eggs in first year





Figs. 26 and 27. Barred Plymouth Rock hen, No. 617. Laid 251 eggs in first year.



Figs. 28 and 29, Barred Plymouth Rock hen, No. 1003. Laid 240 eggs in first year.